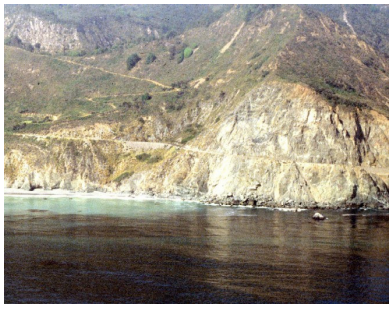
Why we need… a bridge at Pitkins Curve and a rock shed at Rain Rocks

Highway 1, 0.5 mile north of Limekiln Creek and 1.5 miles south of Lucia, on the Big Sur coast, Monterey County, California
05-MON-1 PM 21.3/21.6; EA 05-0E9600



1987

2002

2005

Prepared by State of California
Department of Transportation

Caltrans

Project Location Map

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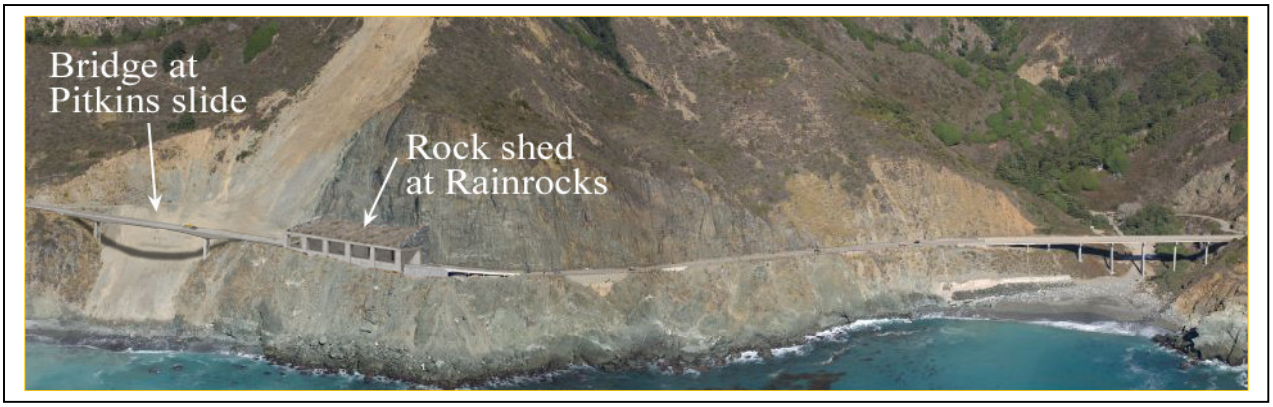

Photo simulation of the selected project solution: a bridge at Pitkins Curve and rock shed at Rain Rocks

- Pitkins Curve/Rain Rocks presents Caltrans with its toughest maintenance challenges in the central California coastal area.

- Extensive landslides occur repeatedly — reducing or severing travel on Highway 1 for months at a time and profoundly affecting local and regional economies.

- Emergency highway work is the least satisfactory option for highway maintenance. It limits the options we have for repairs, increases risk for highway workers, elevates costs, and jeopardizes environmental resources.

- Without the bridge and rock shed, the highway at Pitkins Curve and Rain Rocks will continue to be damaged, and access will be disrupted and severed repeatedly. The purpose of this project is to increase safety, decrease maintenance expenditures, and improve roadway reliability.

- A bridge and rock shed provides the most dependable, safest and least expensive long-term solution to costly, unpredictable and disruptive landslide-induced closures of Highway 1 at Pitkins Curve and Rain Rocks in Monterey County, California.

Location Characteristics

The 0.3-mile-long project, located 0.5 mile north of Limekiln Creek and 1.5 miles south of Lucia, encompasses two areas of roadway instability: "Pitkins Curve" to the north, and "Rain Rocks" to the south.

Highway 1 in the project area — the Big Sur Coast Highway — is a state scenic highway and a national scenic byway "All-American Road." This stretch of highway traverses the steepest coastal slope in the contiguous United States and is world-renowned for its rugged beauty. It is the primary road serving the Big Sur communities and a vast number of tourists. These people rely on the highway for essential and emergency services, for income, and for access to recreational sites.

The Big Sur coastline is also known to be geologically active and unstable. Much of it is mountainous and made up of broken and weak rocks covered with eroded soils that are highly prone to landslides, as is the case at Pitkins Curve. Other locations, such as at Rain Rocks, are characterized by blocks of semi-volcanic rocks that are relatively large and hard, covered with smaller rock and soil. Groundwater, surface water infiltration, and erosion, combined with heavy rainfall from winter storms, trigger landsliding and rockfall. Over the years, these disruptive forces have repeatedly damaged the highway at Pitkins Curve/Rain Rocks.

History of Landslides and Highway Repair

From the time Highway 1 was completed in 1937, slopes above and below it have been in a constant state of erosion, shedding debris onto the road and slumping below the road.

The 1998 El Niño storms caused the most damage to the Big Sur Coast Highway in its history. At Pitkins Curve, landsliding below the highway undermined the southbound lane. Highway restoration cost $1 million and disrupted traffic for five months. El Niño also activated rockfall at Rain Rocks. To ensure safety for travelers and highway workers, the

Rain Rocks slope was covered with a wire mesh rock net. This cost $1 million and disrupted traffic for 20 days.

In 2000, a massive landslide below the highway at Pitkins Curve took out both lanes. Restoration required removal of 100,000 cubic yards of landslide debris in 7,000 truckloads. It closed the highway for 30 days, severely limited travel for a subsequent 60 days, and cost $3.4 million.

Winter storms in 2001 triggered landsliding above Pitkins Curve and intensified rockfall at Rain Rocks. A catchment ditch and an earth berm were constructed to contain landslide material until it could be trucked away. A portion of the rock net at Rain Rocks was replaced with a stronger cable mesh. Traffic was disrupted for two months and 1400 truckloads of material were removed from the highway at a cost of $1.5 million.

Each year since 2001, approximately 10,000 cubic yards (or 700 truckloads) of material have been transported away from the site. These routine maintenance efforts require about 10 days of road closure and cost an average of $1 million. Caltrans geologists and geotechnical engineers have studied the slopes at Pitkins Curve and Rain Rocks and have concluded that, the hillsides will persist in sliding and, without a more comprehensive solution, the highway will still be damaged repeatedly, and local and regional access will be continue to be disrupted and severed.

High Repair and Maintenance Costs

Pitkins Curve/Rain Rocks has higher maintenance costs than any other segment of the Big Sur Coast Highway. Between 1998 and 2004, about $8 million was spent at this single location — more than $1 million a year. (By comparison, the other unstable Big Sur Coast Highway locations requiring regular maintenance cost $10,000-20,000 a year.)

Funds for emergency highway repair can be obtained from the state — or, if damage is widespread and a Federal State of Emergency is declared (as was the case during the El Niño storms of 1998) — from federal sources. Emergency funding can be uncertain, however, especially if local emergency projects must compete for funding when damage is widespread throughout the state or nation.

Travel Disruption

When travel is disrupted on Highway 1, the local and regional economies suffer a significant loss of tourist revenue. Approximately 95 % of vehicles traveling on the Big Sur Coast Highway are visiting from out of the area. In 2000, for example, highway closures led to a 6-10 % decrease in visitation at Hearst Castle and an estimated loss of $150,000 to the Department of Parks and Recreation. Visitors to Hearst Castle account for about a third of the $900 million tourist-related revenue generated in San Luis Obispo County and an unspecified amount of that in Monterey County. For travelers between northern San Luis Obispo County and the Monterey Peninsula there are no alternate coastal routes. When the highway is closed, travelers must either wait until the road is open or travel up to 100 miles out of direction to reach their destinations.

Highway Worker Safety

Highway workers often work under hazardous conditions while maintaining Pitkins Curve/Rain Rocks — scaling cliffs with technical equipment to knock down precariously situated boulders from the hillside and using mechanized equipment to scoop up rocks that have fallen behind the protective berms. These activities place them in the most active rockfall areas. Extraordinary precautions must be taken to ensure worker safety. Exposure to rockfall in high, and Caltrans highway workers have reported numerous rockfall-related accidents.

Environmental Impacts

Environmental impacts, particularly those associated with soil disposal, are difficult to avoid or minimize when emergency restoration work is done on the highway. Among the most difficult and expensive activities at Pitkins Curve/Rain Rocks is the handling of large volumes of rock and soil generated by landslides and subsequent highway repair. In times past, soil was pushed seaward. Since the designation of the Monterey Bay National Marine Sanctuary in 1992, however, this practice has been avoided, in response to concern over potential impacts to the marine environment. Soil is now trucked to inland locations 10 or more miles away. The number and capacity of nearby stockpile sites is limited and diminishing. As soil is transported further and further from where it was generated, the associated monetary and environmental costs increase.

The Cost of the Project

Life-cycle Cost Comparisons

		Bridge and Rock Shed	No Project
Cost	Construction Costs	$26.5 to 33.7 million	N/A[1]
	Maintenance Costs[2]	$1.7 million	$112.0 million
	TOTAL	$28.2 to 34.7 million	$112.0 million

Construction of the bridge and rock shed allow the natural geologic processes to occur and landslide material to fall unobstructed to the ocean. Maintenance costs are substantially reduced, traffic flow is unimpeded and the highway dependability is significantly improved.

The cost to construct the bridge and rock shed ranges from between $26.5 to 33.7 million, depending on the ultimate design. The life span of the bridge and rock shed is conservatively estimated to be 50 years. Over that period, the total cost of maintaining the highway, with a bridge and rock shed in place, is estimated to be $1.7 million. The total cost of building and maintaining the bridge and rock shed over the life span of the structures is estimated to be between $28.2 and 34.7 million.

If the situation at Pitkins Curve and Rain Rocks were to remain unchanged, the cost of managing the landslides and of catastrophic repair over the 50-year period is estimated to be $112.0 million. These costs were estimated from actual expenditures and escalated over the life span of the project.

If you have questions or would like more information about this project, please contact Dave Rasmussen, Project Manager, at (805) 549-3677 or Wendy Waldron, Project Environmental Planner, at (805) 549-3118.

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[1] In the event of a catastrophic failure, the cost to restore the highway is estimated to be in excess of $45,000,000.

[2] Maintenance activities include annual removal of soil and regular replacement of cable/rocknet. Costs were based on the last six years of actual maintenance expenditures and escalated for the estimated life span of the project, which is 50 years, using a 3% annual inflation rate.